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(54) Abstract Title: **Proximity fuse**

(57) A proximity fuse has a laser range finder to detect a target and uses a lens (3) with light conductor (1). The image (4) is presented in plane (Z). To detect fog, which disperses the radiation into a corona-like form in zone (5) three detectors (2) are provided. By this means a wall of fog can be detected and firing inhibited. Firing is inhibited when the combined output of the detectors exceeds a threshold value.

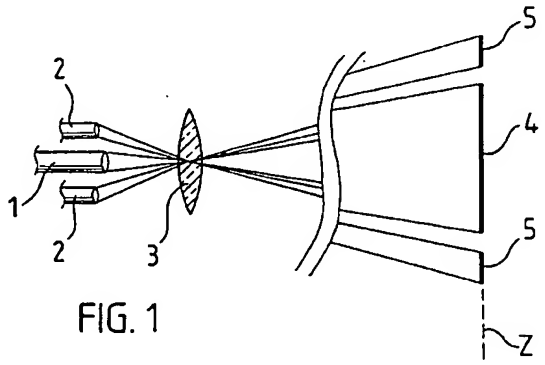

FIG. 1

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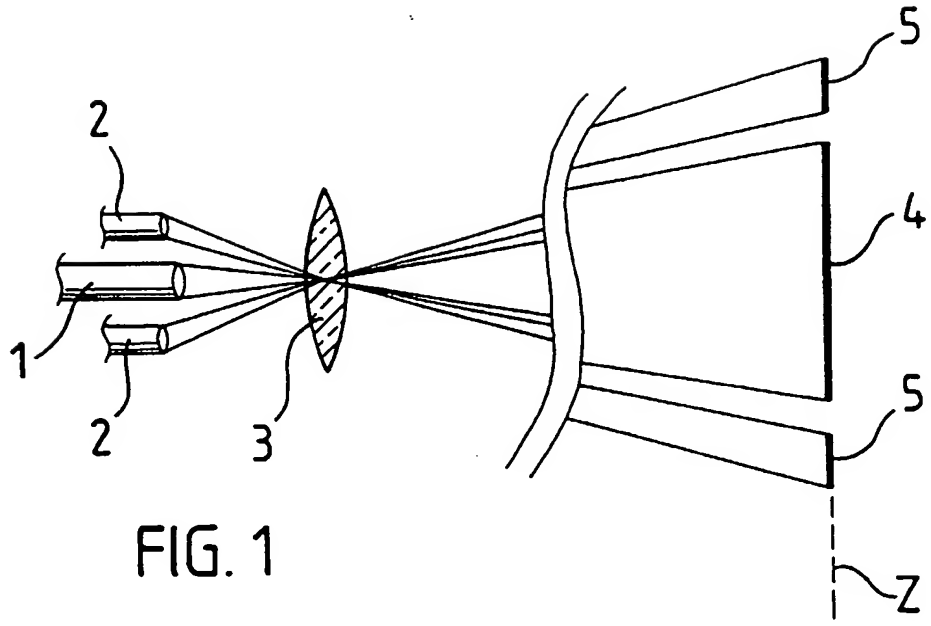

FIG. 1

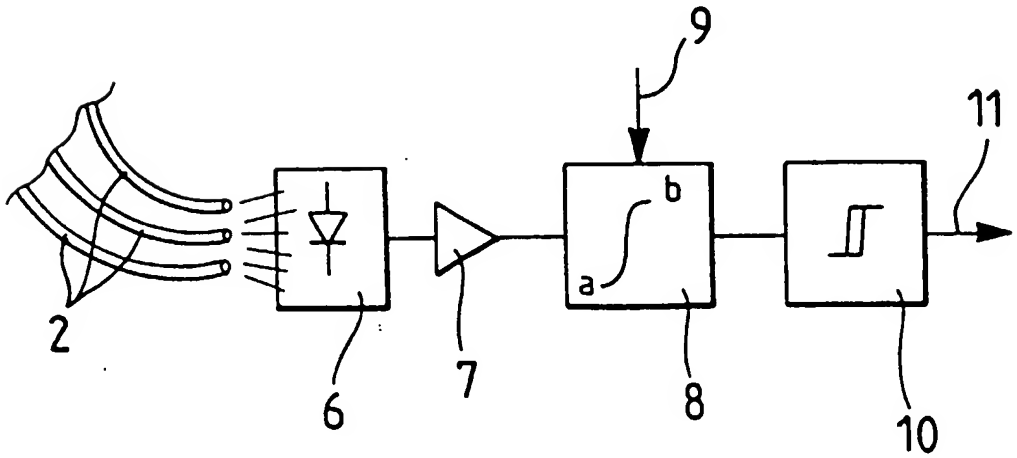

FIG. 2

TITLE

A Proximity Fuse

This invention relates to a proximity fuse with a laser range finder which is to be directed at a target, detectors associated with the range finder providing output signals which are evaluated in order to control the detonation signal from the laser range finder.

DE 36 01 053 C2 describes a triggering device for a weapon which is aimed at a target and which has a laser range finder as a releasing sensor. Associated with the laser range finder are two detectors separated by a defined angle, the output signals of the detectors being evaluated in order to determine whether a detonation lead or lag has to be taken into account. There are nevertheless no further ancillary functions for increasing the operating reliability of the releasing sensor.

This invention seeks to provide a proximity sensor using a laser range finder in such a way that the weapon will not be incorrectly triggered if a natural or artificial fog or smoke screen occurs between the sensor and a perceived target.

According to this invention there is provided a

proximity fuse with a laser range finder which is to be directed at a target, the fuse including detectors of which the output signals are evaluated in order to control the detonation signal, wherein the receiving elements of at least three detectors are positioned in symmetrical relationship around the periphery of a reflector element of the laser range finder, the optical axes of the receiving elements directly surrounding the beam of the said range finder, the output signals of the detectors being combined and evaluated by means of a signal threshold comparator, a signal serving to block the detonation signal emitted by the range finder being generated in the event that the said threshold is exceeded.

The advantage of this invention, particularly in comparison with known opto-electronic proximity sensors, resides in the fact that if a target is camouflaged by fog then the weapon will not be incorrectly triggered at the assigned detonation distance from the front of the wall of fog as a result of the back-scatter radiation from the fog, because the apparatus is able to distinguish the said back-scatter from a weakly reflected target. Furthermore, interference light sources such as refraction, reflection or dispersion in the optical system are temporarily blocked by the

selected measuring range and thus not detected.

An embodiment as example of this invention is illustrated schematically on simplified lines in the accompanying drawing and will be described in detail hereinafter.

In the drawings:-

Figure 1 shows a system comprising a laser range finder and a number of detectors, together with the fields of view thereof, and

Figure 2 shows a block diagram of an evaluation circuit.

This invention is based on the realisation that a laser beam encountering a wall of fog generates around the transmission point of the beam a dispersion field in the nature of a corona. The detection of this dispersion field shows whether one is dealing with a wall of fog or with a weakly reflecting target, since light dispersions of this kind only occur with dispersive media with distinct boundary layers, such as dust, fog or cloud.

Figure 1 illustrates a measuring system for the recognition of a dispersion field surrounding the transmission point of a laser range finder in a dispersive medium. A light conductor 1, through a lens

system 3, reflects the light from a source (not shown in the drawing) so that a transmission point 4 is imaged in a plane Z corresponding to the target. If the plane Z is approximately in the range of the front face of a wall of fog, the transmission point 4 is surrounded by a dispersion field. To enable this field to be detected the light conductor of the laser range finder is surrounded by a number of opto-electronic detectors 2 which share the lens system 3 and of which the fields of view 5 directly surround the transmission point 4 in the plane Z. In Figure 1 these detectors are constructed as further light conductors 2, directed together to a photo-diode 6, as shown in Figure 2. To improve the reliability of the system from the point of view of detection at least three such additional light conductors 2 are employed. With the use of a combination of light conductors surrounding the transmission light conductor, the fog detection can be optimized even when the light intensities of the dispersion field are low.

The detector signals can be processed individually according to the application of the system. If the fog wall detector is used with opto-electronic proximity sensors on a pulsed time principle (pulsed time division multiplex) a signal processing system such as shown on

simplified lines as a block diagram in Figure 2 could be used. To improve the signal-to-noise ratio a photo-detector 6 is followed by an amplifier 7 of which the output signal is conveyed to a non-inverting gate integrator 8. The gate width (a,b) of the integrator selects the measuring range for the apparatus, the opening and closing of the gate being controlled synchronously with the transmission pulse, which in its turn is conveyed to the integrator 8 through the conductor 9. The output signal of the integrator actuates a threshold value comparator 10. If the selectable signal threshold is exceeded the comparator emits a control signal required for blocking the detonation signal from the proximity sensor. The signal evaluation system described offers the further advantage that by multiple integration over the desired measuring range the signal-to-noise ratio is considerably improved.

CLAIMS

1. A proximity fuse with a laser range finder which is to be directed at a target, the fuse including detectors of which the output signals are evaluated in order to control the detonation signal, wherein the receiving elements of at least three detectors are positioned in symmetrical relationship around the periphery of a reflector element of the laser range finder, the optical axes of the receiving elements directly surrounding the beam of the said range finder, the output signals of the detectors being combined and evaluated by means of a signal threshold comparator, a signal serving to block the detonation signal emitted by the range finder being generated in the event that the said threshold is exceeded.

2. A proximity fuse in accordance with Claim 1, wherein the reflector element of the laser range finder and/or the receiving elements of the detectors are constructed as optical conductors.

3. A proximity fuse in accordance with Claim 1 or 2, wherein the reflector and receiving elements are provided with a common lens system.

4. A proximity fuse in accordance with Claim 1, wherein the output of the receiving elements are fed to a detector of which the output signal is evaluated in a subsequent integrator, the integration time being selected synchronously with the transmission pulse of the laser range finder and the measuring range of the apparatus being determined by the gate width and width of the transmission pulse, the output signal of the integrator being fed to a threshold value comparator.

5. A proximity fuse constructed and arranged to function as described herein and exemplified with reference to the drawings.

6. A weapon including the proximity fuse of any preceding claim.

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Amendments to the claims have been filed as follows

1. A proximity fuse with a laser range finder which is to be directed at a target, the fuse including detectors of which the output signals are evaluated in order to control the detonation signal, wherein at least three receiving elements of an additional detector or detectors are positioned in symmetrical relationship around the periphery of an emission element of the laser range finder, the optical axes of the receiving elements directly surrounding the beam of the said range finder, the output signals of the additional detector(s) being evaluated by means of a signal threshold comparator to produce a signal serving to block the detonation signal emitted by the range finder in the event that the said threshold is exceeded.

2. A proximity fuse in accordance with Claim 1, wherein the emission element of the laser range finder and/or the receiving elements of the additional detector(s) are constructed as optical conductors.

3. A proximity fuse in accordance with Claim 1 or 2, wherein the emission and receiving elements are provided with a common lens system.

4. A proximity fuse in accordance with Claim 1, wherein the output of the receiving elements are fed to an additional detector of which the output signal is evaluated in a subsequent integrator, the integration time being selected synchronously with the transmission pulse of the laser range finder and the measuring range of the apparatus being determined by the gate width and width of the transmission pulse, the output signal of the integrator being fed to a threshold value comparator.

5. A proximity fuse constructed and arranged to function as described herein and exemplified with reference to the drawings.

6. A weapon including the proximity fuse of any preceding claim.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number

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Relevant Technical fields

(i) UK Cl (Edition K) F3A (ABC, ACE, ADH)

(ii) Int Cl (Edition 5) F42C

Search Examiner

T BERRY

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

19 June 1991

Documents considered relevant following a search in respect of claims

1 to 6

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	